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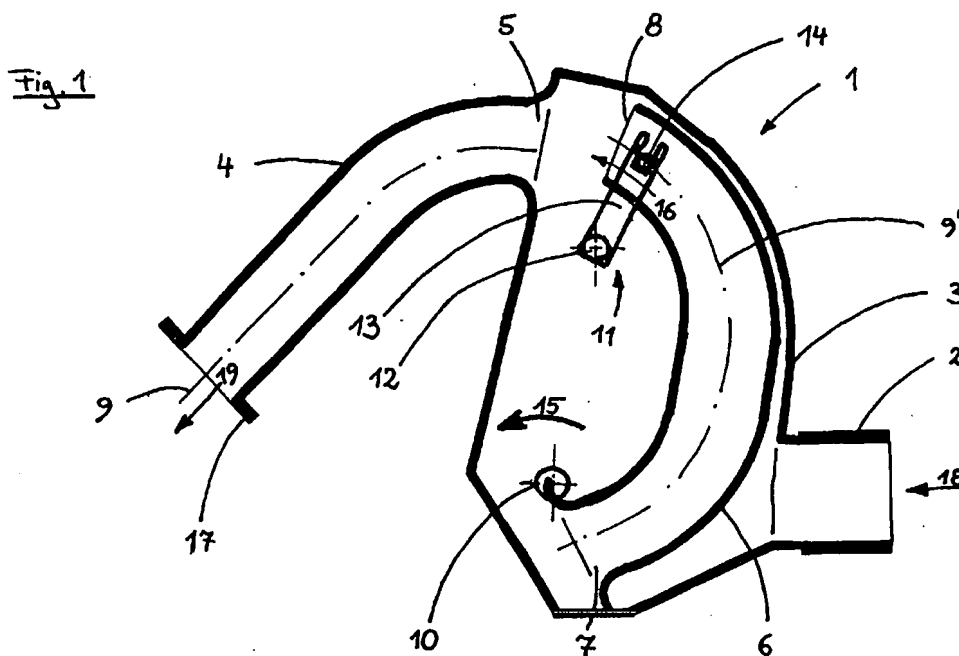
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(54) Sauganlage für eine Brennkraftmaschine

(57) Sauganlage für eine Brennkraftmaschine mit zumindest einem längenänderbaren Saugrohr mit einer Saugrohrlängsachse, bestehend aus einem zur Brennkraftmaschine festem Saugrohrabschnitt mit einer Lufteinlassöffnung und einem, um eine normal zur Saugrohrlängsachse angeordneten Drehachse schwenkbar angeordnetem Saugrohrabschnitt mit einer Einströmöffnung und einer Ausströmöffnung, der durch Schwen-

ken um die Drehachse mit der Ausströmöffnung an die Lufteinlassöffnung ankoppelbar ist, wobei die Drehachse direkt an dem schwenkbar angeordneten Saugrohrabschnitt, näher an der Einströmöffnung als an der Ausströmöffnung, angeordnet ist.

Diese Ausgestaltung einer Sauganlage benötigt wenig Bauraum und die Verstellung der Saugrohrlänge benötigt ein geringes Antriebsmoment.





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EUROPÄISCHER RECHERCHENBERICHT

Nummer der Anmeldung
EP 02 00 7801

EINSCHLÄGIGE DOKUMENTE			
Kategorie	Kennzeichnung des Dokuments mit Angabe, soweit erforderlich, der maßgeblichen Teile	Betrifft Anspruch	KLASSIFIKATION DER ANMELDUNG (Int.Cl.7)
A, D	DE 41 02 453 A (BAYERISCHE MOTOREN WERKE AG) 30. Juli 1992 (1992-07-30) * das ganze Dokument *	1-3,9	F02B27/02
A	DE 196 34 913 A (PIERBURG AG) 5. März 1998 (1998-03-05) * das ganze Dokument *	1-3,5-7	
A	DE 197 28 600 A (ROBERT BOSCH GMBH) 7. Januar 1999 (1999-01-07) * das ganze Dokument *	1-3,9	
			RECHERCHIERTE SACHGEBIETE (Int.Cl.7)
			F02B
Der vorliegende Recherchenbericht wurde für alle Patentansprüche erstellt			
Recherchenort DEN HAAG		Abschlußdatum der Recherche 23. April 2003	Prüfer Van Zoest, A
<p>KATEGORIE DER GENANNTEN DOKUMENTE</p> <p>X : von besonderer Bedeutung allein betrachtet Y : von besonderer Bedeutung in Verbindung mit einer anderen Veröffentlichung derselben Kategorie A : technologischer Hintergrund O : nichtschriftliche Offenbarung P : Zwischenliteratur</p> <p>T : der Erfindung zugrunde liegende Theorien oder Grundsätze E : älteres Patentdokument, das jedoch erst am oder nach dem Anmeldedatum veröffentlicht worden ist D : in der Anmeldung angeführtes Dokument L : aus anderen Gründen angeführtes Dokument & : Mitglied der gleichen Patentfamilie, übereinstimmendes Dokument</p>			

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**ANHANG ZUM EUROPÄISCHEN RECHERCHENBERICHT
 ÜBER DIE EUROPÄISCHE PATENTANMELDUNG NR.**

EP 02 00 7801

In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten europäischen Recherchenbericht angeführten Patentedokumente angegeben.

Die Angaben über die Familienmitglieder entsprechen dem Stand der Datei des Europäischen Patentamts am
 Diese Angaben dienen nur zur Unterrichtung und erfolgen ohne Gewähr.

23-04-2003

Im Recherchenbericht angeführtes Patentedokument		Datum der Veröffentlichung	Mitglied(er) der Patentfamilie	Datum der Veröffentlichung
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Für nähere Einzelheiten zu diesem Anhang : siehe Amtsblatt des Europäischen Patentamts, Nr.12/82



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[0001] The invention concerns a suction plant for an internal-combustion engine in accordance with in the generic term of the patent claim 1 described design.

[0002] The invention goes out from the DE 41 02 453 A1. In this a suction plant for internal-combustion engines with an lengthen-alterable intake is described. The intake of the suction plant is implemented into a machine-firm section and into a movably arranged, as pipe elbow unions out-arranged section. For the achievement of a simple structure of the suction plant it is suggested that the pipe elbow union is movably arranged separately by the machine-firm section currentup the delta of the machine-firm section for the length variation of the intake. For this an axis of rotation, over bars of the pipe elbow union beabstandet, is trained on the pipe elbow union internal radius side. The pipe elbow union is swivelled depending upon operating condition of the internal-combustion engine around the axis of rotation, whereby the length of the entire suction tube extends by the length of the pipe elbow union and/or. one shortens.

[0003] At this arrangement the relatively large building space requirement is unfavorable due to the Beabstandung of the tube bend to the axis of rotation.

[0004] Task of the invention is it to represent a small and compact swiveling mechanism for an lengthen-alterable intake.

[0005] This task is solved by the characteristics in the characteristic part of the patent claim 1. The suction plant can be laid out by this arrangement for me considering the building area clearly smaller than with arrangements large swivel arms. These building space advantages within the sucking in range make the integration of a suction plant in an anyway close engine compartment clearly simpler.

[0006] Additionally to the reduced building area due to the local misalignment of the axis of rotation a further advantage is obtained in accordance with requirement 2 by the fact that the suction tube in the middle process can deviate during this arrangement from a circular arc form nearly at will. Thus suction tube geometry is to be adapted simply to the internal contour of the suction plant.

[0007] An arrangement according to requirement 3 improves the flowing in behavior by the avoidance of flow losses in the lengthen-alterable intake completely clearly. The reduction of the flow losses leads to higher engine performance with perhaps smaller consumption.

[0008] An arrangement according to requirement 4 leads to a very compact arrangement of the lengthen-alterable intake in a suction plant.

▲ top [0009] According to the requirements 5 and 6 Kraft, which is needed for adjusting the lengthen-alterable intake, become over different lever arm lengths in the sliding mechanism and/or. in a multi-linkage gearing supports. A lower drive moment is needed by the transfer of the drive axle and simultaneous separation from the axis of rotation than with conventional swiveling plants. From this a smalldimensioned and thus economical actuator results, or with same actuator size a higher regulating speed in favourable way either.

[0010] According to requirement 7 the use of nearly each placing element is possible. In addition direct current motors belong and/or beside further stepping motors. also linear motors.

[0011] According to requirement 8 in favourable way both the axis of rotation and the drive are arranged inside the suction plant. Thus no placing elements must and/or. Power train elements by the hermetically laid out suction plant to be outward led.

[0012] Favourable way is optimally sealed tiltable after requirement 9 the ouple place between the firm section of the suction tube and the section arranged. Sucking in fresh air by a momentarily wrong suction tube length is thus avoided.

[0013] In the following a preferential remark example is more near described in only one figure.

[0014] Figure 1 shows a cut by a suction plant 1, essentially consisting of an opening 2, those into an air collecting tank 3 leads into and a firm suction tube section 4 with an air intake opening 5. Inside the air collecting tank 3 a tiltable suction tube section 6 arranged with a flowing in opening 7 is and a discharge opening 8. The firm suction tube section 4 has a suction tube longitudinal axis 9, the tiltable suction tube section 6 has a suction tube longitudinal axis 9'. The flowing in opening 7 is formed out as funnels, to which an

axis of rotation 10 is fastened. In the range of the discharge opening 8 a placing element 11, consisting of a wave 12 arranged with a sliding window blind 13 is. In the sliding window blind 13 a window blind stone 14 is led, the component of the tiltable suction tube section 6 is.

[0015] With enterprise the tiltable suction tube section 6, as the name already says, around the axis of rotation 10 can be swivelled. Hereby the effective suction tube length is changed.

[0016] Sucked in with the enterprise of the internal-combustion engine the intake air in an air flowing in direction will become 18 by the opening 2, arising Luftpulsationen in the air collecting tank 3 calmed down, afterwards the intake air either depending upon attitude by the firm suction tube section 4 or by the firm suction tube section 4 and the tiltable suction tube section 6 in an air leaking out direction 19 of the internal-combustion engine is supplied.

[0017] As is common knowledge, is a pipe for the air column in it is a Schwingsystem. The resonant frequency depends primarily on the length of the pipe. The more briefly the pipe length, the higher-frequency is the resonant frequency of the Schwingsystems. At high numbers of revolutions of an internal-combustion engine for this reason short suction tubes are used, in order to receive a better filling degree of the cylinder of the internal-combustion engine attached to the suction plant 1. This corresponds to the pipe length of the firm suction tube section 4, from its air intake opening 5 up to a mounting flange 17 in the figure 1.

[0018] Filling degree means, how much air of the pistons sucks in into the cylinder. A good filling degree, much air is sucked in, means a better achievement and torque delivery of the internal-combustion engine.

[0019] If the internal-combustion engine with a lower number of revolutions is operated, the effective suction tube length is extended, so that the filling degree of the internal-combustion engine is improved like before at high numbers of revolutions. Extending the effective suction tube length takes place as previously mentioned via swivelling the tiltable suction tube section 6 in a swiveling direction 15 around the axis of rotation 10. This takes place with the placing element 11, whose wave 12 by a not represented stepping motor in a placing direction 16 is propelled. The window blind stone 14 fastened to the tiltable suction tube section 6 is carried forward by the rotating motion in the window blind, until the discharge opening 8 the air intake opening 5 rests upon flat and hermetically.

[0020] So that the effective suction tube length is not changed by leakages in the couple place, the couple place from a soft plastic is implemented. In this suction tube position air sucked in by the internal-combustion engine flows by the opening 2 in the air flowing in direction 18, which becomes Luftpulsationen likewise in the air collecting tank 3 calmed down, far by the flowing in opening 7, by the tiltable suction tube section 6, the firm suction tube section 4 and leaves the suction plant 1 in the air leaking out direction 19. The effective suction tube length amounts to now the distance of the flowing in opening 7 up to the mounting flange 17. In the coupled condition the suction tube longitudinal axis 9 and the suction tube longitudinal axis 9 form ' a common only suction tube longitudinal axis.

[0021] The entire suction plant 1 can be as today generally usually, einstückig or mehrstückig either made of plastic or made of light alloy manufactured. In the remark example represented here the tiltable suction tube section 6 and the axis of rotation 10 are einstückig manufactured to interconnect it are however also possible to manufacture the axis of rotation 10 and the tiltable suction tube section 6 separately and afterwards.

[0022] The tiltable suction tube section 6 can be implemented with nearly arbitrary curvatures, and/or. it can be laid out also according to the building area the available as an as far as possible straight pipe.

[0023] In place of the placing element 11 laid out as sliding window blind, also a multi-linkage gearing can be blocked.

[0024] As drive for the wave 12 each commercial wave drive can be used. This does not have to work rotatorisch, but also translatorische adjustment devices are here possible. The adjustment can take place hydraulically, pneumatically or electromechanically.

[0025] Depending upon building area the available the axis of rotation 10 and the placing element 11 can be arranged also on the opposite sides of the tiltable suction tube section 6. The axis of rotation 10 does not have to be beyond that directly at the flowing in opening 7 arranged, it can also further toward the discharge opening 8 lie, depending on which spatial relations to be present.

Reference symbol list:

- 1 Suction plant
- 2 Opening
- 3 Air collecting tank
- 4 firm suction tube section
- 5 Air intake opening
- 6 tiltable suction tube section
- 7 Flowing in opening
- 8 Discharge opening
- 9, 9 ' Suction tube longitudinal axis
- 10 Axis of rotation
- 11 Placing element
- 12 Wave

- 13 Sliding window blind
- 14 Window blind stone
- 15 Swiveling direction
- 16 Placing direction
- 17 Mounting flange
- 18 Air flowing in direction
- 19 Air leaking out direction